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54 Contact Free Chip Card and Process for Manufacturing such a Chip Card[1].

57 This invention pertains to the economical and high quality production of contact free chip cards, key forms and pre-laminates where unpackaged chips are attached to a reel[2] that is applied on a carrier film and are protected by the appropriate encapsulation. In order to protect the chip 3 of a chip card that is on the carrier film 2 from damage through bending of the carrier film or chip card, either during the manufacturing process and afterwards as a finished chip card, a wall 4 is applied on the carrier film 2 at least partially around the chip 3 at a specified distance from the chip 3. The basin 5 that is formed between the edge of the chip 3 and the wall 4 is filled with a curable flowable mass 10. The chip 3 is protected from bending of its carrier film 2, by the wall 4 and the cured flowable mass 10. A layer 11 containing a gap 12 for the chip 3, wall 4 and flowable mass 10 is laminated or heat sealed onto the carrier film, resulting in a flat pre-laminate.

[1] Chip Card: Literal translation. Chip cards are also commonly referred to in English as "Smart Cards"
[2] reel: The German work "Spule" also translates to "spool" or "coil"

Description

[0001] The invention pertains to a contact free chip card, whose chip is connected to a reel applied to a carrier film.

[0002] The invention furthermore pertains to a process for manufacturing a contact free chip card, whose chip is connected to reel applied on a carrier film.

[0003] Debit cards, credit cards, phone cards, insurance cards and identification cards (only to name a few examples of the many machine-readable cards) are issued as chip cards, which are made of several layers of film. On one of these layers (carrier film with an applied reel), a chip is situated - a highly integrated electronic circuit.

[0004] A chip card is constructed of several stacked films that are laminated or heat sealed together. The chip is situated on a carrier film with a reel applied to it. The film is unwound from rolls and further processed by several machines on the assembly line such that the finished product - the contact free chip card - is ready for shipment at the end of the assembly line. The manufacturing process can also occur in a sheets rather than rolls.

[0005] While the film is being processed in the individual machines, the film is not always fed through the machines in a straight line, but can be bent. Because the film is flexible, it is not damaged by this, however the risk still remains that the chip and it connections would be damaged by this bending. A chip card with a chip that was already damaged during the manufacturing is useless and needs to be discarded as a special waste stream. Although by simply carrying it around, whether it is loosely carried around or placed in a wallet, especially when placed in the rear seat pants pockets, there is risk that the chip can bent and thus likely damaged.

[0006] The objective of the invention is create a process for manufacturing a contact free chip card as well as chip card itself such that the chip is applied to the carrier film in its wafer form and attached to the reel and is protected especially against bending of the chip card as well as against partial pressure being applied to the chip.

[0007] Process-wise, this objective is solved during the manufacture of the chip card, whose chip is attached to a carrier film, where a wall is created on the carrier film in a specified distance completely or at least partially around the chip and the basin that is formed between the wall and the chip is filled with a flowable mass.

[0008] Equipment-wise this objective of the chip card whose chip is attached to a carrier film is solved in that a wall is completely or partially applied around the chip and the basin between the wall and chip is filled with a flowable mass.

[0009] In the manufacturing process pursuant to the invention of the chip card pursuant to the invention, the first process step is to partially, or preferably, completely form a wall around the chip at a specified distance from the chip, that is at least as high as the distance the chip stands above the carrier film. The wall is applied by dispensing a specifiable quantity of a viscous curable mass on the carrier film, via a dosing needle of the first spray apparatus.

[0010] During the second manufacturing process step, a specifiable quantity of a low viscosity flowable mass is injected via a needle of the second spray apparatus into the basin-like space between the chip and the wall until the basin is completely filled with the flowable mass.

[0011] In the first application example of the invention, the basin width, or distance between the edge of the chip and the wall is chosen such that suction arises between the carrier film and chip during the injection of the flowable mass. This is preferably ensured through an "L-movement" of the dosing needle along the edge of the chip. Thus an underfilling is obtained where by

raising the needle over the chip, the basin is completely filled with the flowable mass, the top side of the chip also becoming covered.

[0012] A further application example of the process pursuant to the invention and the chip card pursuant to the invention is not to have the top surface of the chip covered with the flowable mass.

[0013] A light activated epoxy resin adhesive is suitable as the flowable mass, which can be cured by irradiating it with UV light (preferably applied with a light guide). The flowable mass for the wall and the filling of the basin have different viscosities so that a combined protective layer is covering the chip so that the chip cannot be damaged in the subsequent manufacturing steps by bending or pressure being applied.

[0014] In order to compensate for the height of the of the applied chip on top of the carrier film, a additional layer with gaps for the chips is applied to the carrier film and laminated or heat sealed in place. Additionally, further film layers, for example, printed ones, can be added such that prelaminates or the complete construction of an identification card are obtained.

[0015] A significant advantage of this invention is that a manufacturing process for contact free identification cards or key chains is obtained where the chip can be incorporated in its wafer form and subsequently protected via the flowable mass, whereby an economical manufacturing in rolls or sheets is possible without additional parts.

[0016] The process pursuant to the invention and the contact free chip card pursuant to the invention are further described via the drawings.

[0017] The drawings show:

[0018] Fig. 1, a section of a carrier film roll or sheet with several chips.

[0019] Fig. 2, a carrier film with a chip and surrounding wall in top view.

[0020] Fig. 3, a cross section through the carrier film with the chip and wall.

[0021] Fig. 4, a cross section through the carrier film with the chip, the wall and basin filled with flowable mass.

[0022] Fig. 5 a cross section of a carrier film with the chip, the wall and the basin filled with flowable mass as well as a layer mounted over it.

[0023] Fig. 6 a cross section of the prelaminate of the chip card.

[0024] In Fig. 1 a carrier film roll 1 is shown in top view, onto which several chip cards are embedded, each with a chip 3. The carrier film roll 1 passed through several machines for processing.

[0025] In Fig. 2 shows a top view of the carrier film 2 of a chip card with a chip. A circular or rectangular shaped wall is formed around the chip spaced such that a basin 5 type of space is formed between the edge of the chip 3 and the wall 4.

[0026] In Fig. 3, a cross section through the carrier film 2 with the wall 4, the chip 3 and the basin 5 are shown. The wall 4 is dispensed onto the carrier film 2 via a dosing needle 7 of a spray apparatus 6. The spray apparatus 6 is moved around the chip 3 to dispense the wall 4. The wall 4 is applied to the carrier film 2 at least as high as the chip 3 extends above the carrier film 2. In the application example shown in Fig. 3, the wall 4 is chosen to be somewhat higher.

[0027] In Fig. 4, the same cross section is seen as in Fig. 3, except the basin 5 is filled with the flowable mass 10 that is injected into the basin 5 via a dosing needle 9 of a second spray apparatus. The second spray apparatus 8 injects a low viscosity flowable mass, for underfilling

between the carrier film and the chip, in an L or U shaped dosing path along the edge of the chip as well as for filling the basin after the needle has traveled above the chip 3.

[0028] As it was previously mentioned, the gap between the chip 3 and the wall 4 - meaning the width of the basin 5 - should be chosen such that suction arises during the filling of the basin 5 with the flowable mass 10 such that the basin 5 is completely filled with the flowable mass 10.

[0029] The flowable mass 10 can also be poured over the top of the chip 3, such that the chip 3 is completely encapsulated by the flowable mass 10.

[0030] In Fig. 5, the third process step of the manufacturing process pursuant to the invention is shown.

[0031] Shown in cross sectional view, a film 11 is positioned around the wall. This film 11 is pressed against the carrier film 2 and either laminated or heat sealed onto it.

[0032] Fig. 6 shows a prelaminate of a finished chip card in cross sectional view. A cover layer 12 is applied to the film 11 and flowable mass 10.

[0033] The chip of the chip card pursuant to the invention is protected from damage by bending not only in the finished chip card form, but also during the manufacturing of the chip card.

Reference Legend

1 Carrier film roll, carrier film sheet
2 Carrier film with reel
3 Chip
4 Wall
5 Basin
6 Spray apparatus
7 Dosing needle
8 Spray apparatus
9 Dosing needle
10 Flowable mass
11 Film with gaps
12 Cover layer
13 Reel

Claims

1. Process for manufacturing a contact free chip card, whose chip 3 is connected to a reel 13 applied on a carrier film 2, wherein a wall 4 is partially or completely formed on the carrier film 2 around the chip 3 in a specified distance from the chip 3 and the basin 5 like space between the wall 4 and the chip 3 is filled with a flowable mass 3.

2. Process of Claim 1, wherein the chip 3 is placed on the carrier film 2 in its wafer state.

3. Process of either Claim 1 or Claim 2, wherein the wall 4 is applied to the carrier film 2 with the dosing needle 7 of the first spray apparatus 6.

4. Process of Claims 1, 2 or 3, wherein the wall 4 is applied to the carrier film 2 at a height that is at least as high as the chip 3 extends above the carrier film 2.

5. Process of Claims 1, 2, 3 or 4, wherein the wall 4 if formed by viscous mass.

6. Process of Claim 5 wherein the viscous mass is curable.

7. Process of any of the previous Claims, wherein the space forming the basin 5 between the wall 4 and the chip 3 is filled with a low viscosity flowable mass 10 by means of a second spray apparatus 8 and a second dosing needle 9.

8. Process of Claim 7, wherein the distance between the edge of the chip 3 and the wall 4 is chosen such that an "underfilling" is obtained during the injection via the second dosing needle 9 of the flowable mass 10 into the basin 5 between the chip 3 and wall 4 formed around the chip 3.

9. Process of any of the previous Claims, wherein the chip 3 becomes completely covered with flowable mass 10 by raising the second dosing needle 9 over the chip 3.

10. Process of any of the previous Claims, wherein an adhesive or a resin is used as the flowable mass 10.

11. Process of any of the previous Claims, wherein the flowable mass 10 is cured with UV light.

12. Process of any of the previous Claims, wherein a film 11 is applied with the chip 3, the wall 4 and the flowable mass to the carrier film 2.

13. Process of Claim 12, wherein a gap is foreseen in the film 11 for the chip 3 and wall 4.

14. Process of Claim 12 or 13, wherein the film 11 is laminated or heat sealed onto the carrier film 2.

15. Contact free chip card, whose chip 3 is attached to a reel 13 applied on a carrier film 2, wherein a wall 4 is partially or completely formed at a specified distance around the chip 3 and the basin 5 formed in the space between the wall 4 and the chip 3 is filled with a flowable mass 10.

16. Chip card of Claim 15, wherein the chip 3 is completely encapsulated with the flowable mass 10.

17. Chip card of Claim 15 or 16, wherein the height of the wall 4 is at least as tall as the distance the chip 3 extends above the carrier film.

18. Chip card of Claims 15, 16 or 17, wherein the wall 4 applied to the carrier film 2 is made of a viscous mass.

19. Chip card of Claim 18, wherein the viscous mass is curable.

20. Chip card of either Claims 15 to 19, wherein an adhesive or resin is used as the flowable mass 10.

21. Chip card of either Claims 15 to 20, wherein the flowable mass 10 is curable with UV light.

22. Chip card of either Claim 15 to 21, wherein a film 11 is applied to the carrier film 2 along with the chip 3, the wall 4 and the flowable mass 10.

23. Chip card of Claim 22, wherein a gap is foreseen in the film 11 for the chip 3, the wall 4 and the flowable mass 10.

24. Chip card of Claim 22 or 23, wherein the film 11 is laminated or heat sealed onto the carrier film 2.

25. Process or chip card of either of the aforementioned claims, wherein the chip 3 is completely surrounded by the wall 4.

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